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DE-A- 3 036 941
DE-A- 3 135 217
JP-U-23 007 550

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Description

1. FIELD OF THE INVENTION

The present invention relates to an improvement of an electric motor, for example, for use in electric components of an automobile.

2. DESCRIPTION OF THE PRIOR ART

Accompanying the increased use of electrified components in the automobile, more small sized electric motors are used as an actuator of the electric components.

A conventional small sized electric motor is described referring to FIG.6. As shown in FIG.6, a permanent magnet 2 is positioned by a leaf spring 3 and fixed on an inner surface of a frame 1 by adhesive. The leaf spring 3 is calked on the frame 1 by a rivet 4. A shaft 13 of a rotor 5 is rotatively born by bearings 7. And the bearings 7 are held by the frame 1 and a cover 6. A brush holder 8 for holding a brush 9 is pinched between the frame 1 and the cover 6. Furthermore, holes 12 are provided on the frame 1 and the cover 6, through which a screw bolt 11 for fixing the above-mentioned conventional electric motor on a base of an electric component (not shown in the figure) penetrates. When an electric current is supplied to windings 5a of the rotor 5 via the brush 9 and a commutator 10, the rotor 5 starts to rotate.

In the above-mentioned conventional electric motor, it is necessary to make the frame serving as a magnetic path sufficiently thick for allowing magnetic fluxes of the magnet 2 effectively therethrough. The weight of the conventional electric motor has been unnecessarily heavy, since some parts of the frame 1 which need not serve as the magnetic path are thick.

Furthermore, hitherto the screw bolt(s) 11 is(are) used for fixing the above-mentioned conventional electric motor to a base of the electric component (not shown in the figure). The screw bolt(s) 11, however, is(are) magnetically attracted to the magnet(s) 2 when the screw bolt(s) 11 is(are) inserted into an inner space of the conventional electric motor. And thereby, the fixing process of the conventional electric motor is very difficult.

DE-A-3 036 941 discloses an electric motor in which a tube-shaped yoke having magnetic positioning protrusions is inserted in a frame.

JP-U-237 550 discloses an electric motor having plural tabs which are provided on a guide plate having plural guide tabs. Each of the plural magnets is positioned in the thrust direction of an electric motor.

SUMMARY OF THE INVENTION

Purpose of the present invention is to solve the above-mentioned problems and to provide an improved electric motor which is of light weight and can be easily fixed on a base of an electric component.

An electric motor in a accordance with the present invention is defined by the features of claim 1.

Claim 2 describes a preferred development of claim 1.

In the electric motor configured as above, the inner yoke is used as a part of the magnetic path. Therefore, the thickness of the frame can be thinner as much as the mechanical strength is maintained. And the weight of the electric motor can be reduced. Furthermore, a pair of the screw bolt guides which are opposing to each other serve as a guide for the screw bolt, so that the screw bolt can be penetrated in the inner space of the electric motor, smoothly.

While the novel features of the invention are set forth particularly in the appended claims, the invention, both as to organization and content, will be better understood and appreciated, along with other objects and features thereof, from the following detailed description taken in conjunction with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG.1 is a cross-sectional side view of an electric motor in accordance with the present invention.

FIG.2 is a cross-sectional front view of the electric motor shown in FIG.1.

FIG.3 is a cross-sectional side view of an inner yoke used in the electric motor shown in FIGs.1 and 2.

FIG.4 is a front view of the inner yoke shown in FIG.3.

FIG.5 is a perspective view of the inner yoke shown in FIGs.3 and 4.

FIG.6 is the cross-sectional side view of the conventional electric motor.

It will be recognized that some or all of the figures are schematic representations for purposes of illustration and do not necessarily depict the actual relative sizes or locations of the elements shown.

DESCRIPTION OF THE PREFERRED EMBODIMENT

An electric motor in accordance with the present invention is described referring to FIGs.1, 2, 3, 4 and 5.

FIG.1 shows I-I section of FIG.2. In FIG.1, an inner yoke 31 is inserted into a frame 21. The frame 21 is substantially cylinder-shaped and the inner yoke 31 is substantially tube-shaped. The outer diameter of the inner yoke 31 is substantially the same as but slightly smaller than the inner diameter of the frame 21. A shaft 13 of a rotor 5 is rotatively born by bearings 7. And the bearings 7 are held by the frame 21 and a cover 6. A brush holder 8 for holding a brush 9 is held

pinched between the frame 21 and the cover 6. Furthermore, holes 12 (shown in FIG.2) are provided on the frame 21 and the cover 6, through which a screw bolt 11 for fixing the electric motor on a base of an electric component (not shown in the figure) is penetrated. When an electric current is supplied to windings 5a of the rotor 5 via the brush 9 and a commutator 10, the rotor 5 starts to rotate.

As shown in FIGs.1, 2, 3, 4 and 5, the inner yoke 31 has plural first magnet positioning protrusions 32, which are for positioning a magnet 22 in the axial direction of the electric motor, and also has plural second magnet positioning protrusions 33, which are for positioning the magnets 22 in rotation direction of the electric motor. The first magnet positioning protrusions 32 are formed by bending protrusions on a first end 31a of the inner yoke 31 in radial direction. The second magnet positioning protrusions 33 are formed by cutting of the side wall of the inner yoke 31 and bending the cut parts to the inner surface 31b of the inner yoke 31. Furthermore, the inner yoke 31 has plural screw bolt guides 34, which are formed by cutting and bending the side wall of the inner yoke 31 on the same lines as those of the second magnet positioning protrusions 33 in the axial direction of the motor and in the vicinity of a second end 31c of the inner yoke 31. The screw bolt guide 34 is bent by 90 degrees or more in order to guide the screw bolt 11 against the magnetic attraction force by the permanent magnets 22.

On the first end 31a of the inner yoke 31, plural stoppers 35 are formed protruding in the axial direction of the motor to contact to the closed end 21a of the frame 21, thereby accurately positioning the inner yoke 31 in the axial direction of the tubular inner space of the frame 21. On several parts of the inner yoke 31 where the magnets 22 are to be positioned, holes 36 are formed, therethrough adhesive is supplied to the magnet 22 for bonding on the inner yoke 31. And at the same time, the inner yoke 31 is bonded on the inner surface of the frame 21, since the adhesive is supplied also on the inner face of the frame 21 through the holes 36.

As is obvious from FIG.1, the inner yoke 31 with the magnets 22 is accurately positioned for facing to the core 5b of the rotor 5 in axial direction of the electric motor for forming effective magnetic path as designed.

When the electric motor in accordance with the present invention shown in FIG.1 is compared with the conventional electric motor shown in FIG.6, the thickness of the frame 21 can be made thinner than that of the conventional frame 1. The total thickness of the frame 21 and the inner yoke 31 at necessary parts to serve as magnetic path, however, is substantially the same as that of the conventional frame 1 (shown in FIG.6). As the thickness of the frame 21 of the electric motor in accordance with the present invention shown in FIG.1 is thinner than that of the frame 1 of the conventional electric motor shown in FIG.6, the total weight of the electric motor in accordance with the present invention also becomes much lighter than that of the conventional electric motor.

The gap between a pair of each-other-opposing screw bolt guides 34 is selected substantially the same as but a little wider than the diameter of the screw bolt 11, in order to enable the screw bolt guides 34 to guide the screw bolt 11 in a manner that the screw bolt 11 is easily penetrated through the inner space of the electric motor without being attracted by the magnet 22. By providing the screw bolt guides 34, the screw bolt 11 can be set not attracted by the magnetic attraction force of the magnets 22.

Claims

1. An electric motor comprising:

a cylindrical frame (21) having a small thickness as to give only a demanded mechanical strength; and

a tube-shaped yoke (31) which is inserted in said frame, said yoke comprising:

plural second magnet positioning protrusions (33) which are formed by cutting a side wall of said yoke and bending the cut part to an inner surface of said yoke for positioning said magnets thereon in circumferential direction of said motor;

characterized by

plural first magnet positioning protrusions (32) of press-bent configuration formed on a first end (31a) of said yoke (31) in inward-radial direction for positioning magnets (22) in said yoke;

plural screw bolt guides (34) which are formed by cutting said side wall of said yoke on the same lines as those of said second magnet positioning protrusions (33) in axial direction of said motor in the vicinity of a second end of said yoke (31) and bending the cut part inward of said yoke, and having a sufficient bending angle for guiding a screw bolt;

plural stoppers (35) which are formed protruding in the axial direction of said motor from said first end of said yoke (31) and which have an inward-bent part for contacting a closed end (21a) of said frame (21) and said inward-bent part is formed at the respective top ends of said plural stoppers in a manner to stop said yoke in a predetermined position; and

plural holes (36) which are formed on respective parts of said inner surface of said yoke where said magnets are to be fixed, whereby an adhesive is supplied on an inner surface of said frame (21) through said holes so that said yoke (31) is simultaneously fixed to said frame when said adhesive is applied to said magnets for fixing

said magnets to said yoke.

2. An electric motor in accordance with claim 1, wherein

gap between a pair of said screw bolt guides (34) which are opposing to each other is slightly wider than a diameter of a screw bolt (11).

Patentansprüche

1. Elektromotor, umfassend:

einen zylindrischen Rahmen (21), der eine geringe Dicke hat derart, daß lediglich eine geforderte mechanische Festigkeit gegeben ist; und

ein rohrförmiges Joch (31), welches in den Rahmen eingesetzt ist, wobei das Joch umfaßt:

mehrere zweite Magnetpositionierungsvorsprünge (33), die gebildet sind durch Schneiden einer Seitenwand des Jochs und Biegen des geschnittenen Teils zu einer Innenfläche des Jochs zum Positionieren der Magnete an ihm in Umfangsrichtung des Motors;

gekennzeichnet durch

mehrere erste Magnetpositionierungsvorsprünge (32) mit pressgebogener Gestalt, die an einem ersten Ende (31a) des Jochs (31) in radialer Einwärtsrichtung gebildet sind zum Positionieren von Magneten (22) in dem Joch;

mehrere Schraubenbolzenführungen (34), die gebildet sind durch Schneiden der genannten Seitenwand des Jochs auf den gleichen Linien wie diejenigen der zweiten Magnetpositionierungsvorsprünge (33) in axialer Richtung des Motors nahe einem zweiten Ende des Jochs (31) und Biegen des geschnittenen Teils einwärts des Jochs, wobei sie einen ausreichenden Biegewinkel zum Führen eines Schraubenbolzens haben;

mehrere Anschläge (35), die in der axialen Richtung des Motors von dem ersten Ende des Jochs (31) vorragend gebildet sind und die einen nach innen gebogenen Teil haben zum Kontaktieren eines geschlossenen Endes (21a) des Rahmens (21), wobei der nach innen gebogene Teil an den betreffenden Oberenden der Mehrzahl von Anschlägen in einer Art und Weise gebildet ist, daß das Joch in einer vorbestimmten Position angehalten wird; und

mehrere Löcher (36), die an betreffenden Teilen der Innenfläche des Jochs gebildet sind dort, wo die Magnete befestigt werden sollen, wobei ein Klebmittel an eine innere Fläche des Rahmens (21) durch die genannten Löcher hindurch zugeführt wird, so daß das Joch (31) gleichzeitig an dem Rahmen befestigt wird, wenn das Klebmittel auf die Magneten aufgebracht wird zum Befestigen der Magnete an dem Joch.

2. Elektromotor nach Anspruch 1, wobei

ein Spalt zwischen einem Paar von Schraubenbolzenführungen (34), die einander gegenüber liegen, geringfügig breiter als der Durchmesser eines Schraubenbolzens (11) ist.

Revendications

1. Moteur électrique comprenant :

une carcasse cylindrique (21) présentant une faible épaisseur de manière à n'assurer qu'une résistance mécanique exigée, et

une culasse en forme de tube (31) qui est insérée dans ladite carcasse, ladite culasse comprenant :

une pluralité de secondes saillies de positionnement d'aimant (33) qui sont formées en découpant la paroi latérale de ladite culasse et en recourbant la partie découpée vers la surface intérieure de ladite culasse afin de positionner desdits aimants sur celle-ci dans le sens circonférentiel dudit moteur,

caractérisé par

une pluralité de premières saillies de positionnement d'aimant (32) de configuration recourbée par enfoncement formées sur une première extrémité (31a) de ladite culasse (31) dans le sens radial vers l'intérieur afin de positionner des aimants (22) dans ladite culasse,

une pluralité de guides de boulon fileté (34) qui sont formés en découpant ladite paroi latérale de ladite culasse sur les mêmes lignes que lesdites secondes saillies de positionnement d'aimant (33) dans le sens axial dudit moteur à proximité d'une seconde extrémité de ladite culasse (31) et en recourbant la partie découpée vers l'intérieur de ladite culasse, et présentant un angle de courbure suffisant pour guider un boulon fileté,

une pluralité de butées (35) qui sont formées saillant dans le sens axial dudit moteur à partir de ladite première extrémité de ladite culasse (31) et qui comportent une partie recourbée vers l'intérieur destinée à toucher une extrémité fermée (21a) de ladite carcasse (21) et ladite partie recourbée vers l'intérieur est formée au niveau des extrémités de dessus respectives de ladite pluralité de butées de manière à arrêter ladite culasse dans une position prédéterminée, et

une pluralité de trous (36) qui sont formés sur des parties respectives de ladite surface intérieure de ladite culasse là où lesdits aimants doivent être fixés, par lesquels un adhésif est appliqué sur la surface intérieure de ladite carcasse (21) à travers lesdits trous de sorte que ladite culasse (31) est simultanément fixée à ladite carcasse lorsque ledit adhésif est appliqué auxdits

aimants afin de fixer lesdits aimants à ladite culasse.

2. Moteur électrique selon la revendication 1, dans lequel l'espace séparant une paire desdits guides de boulon fileté (34) qui se font face est légèrement supérieur au diamètre du boulon fileté (11).

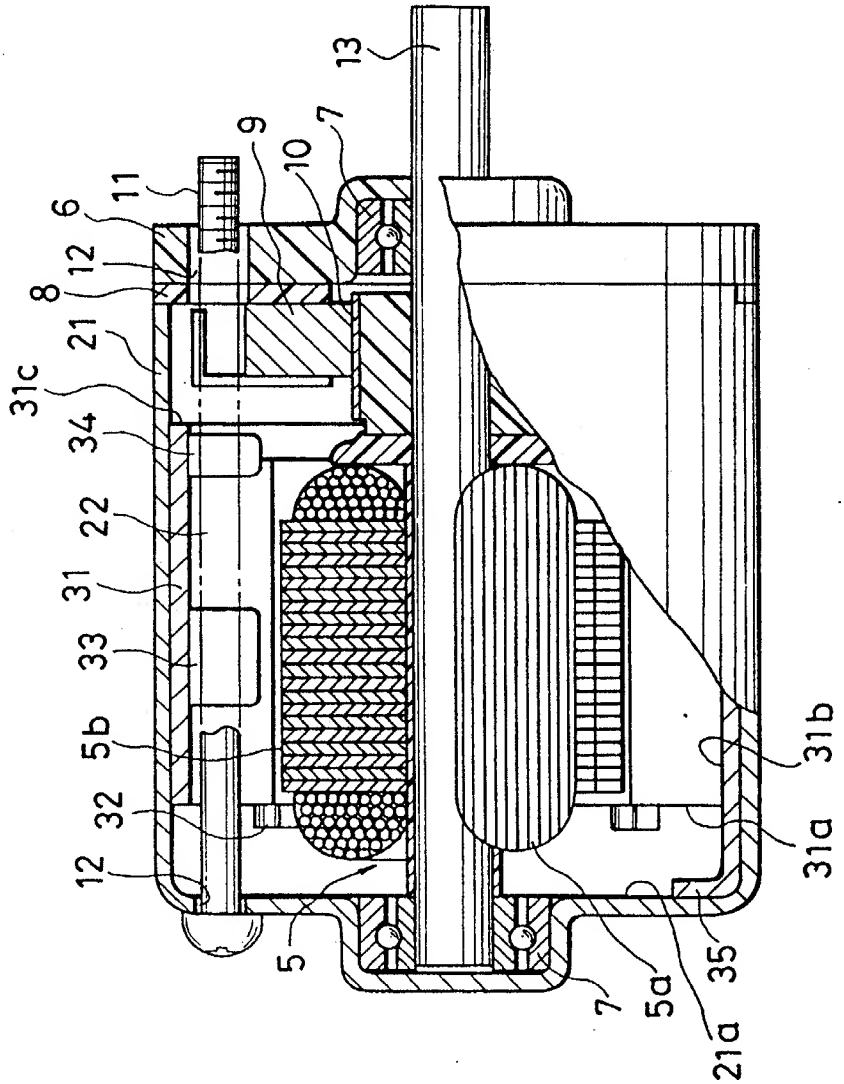


FIG.1

FIG. 2

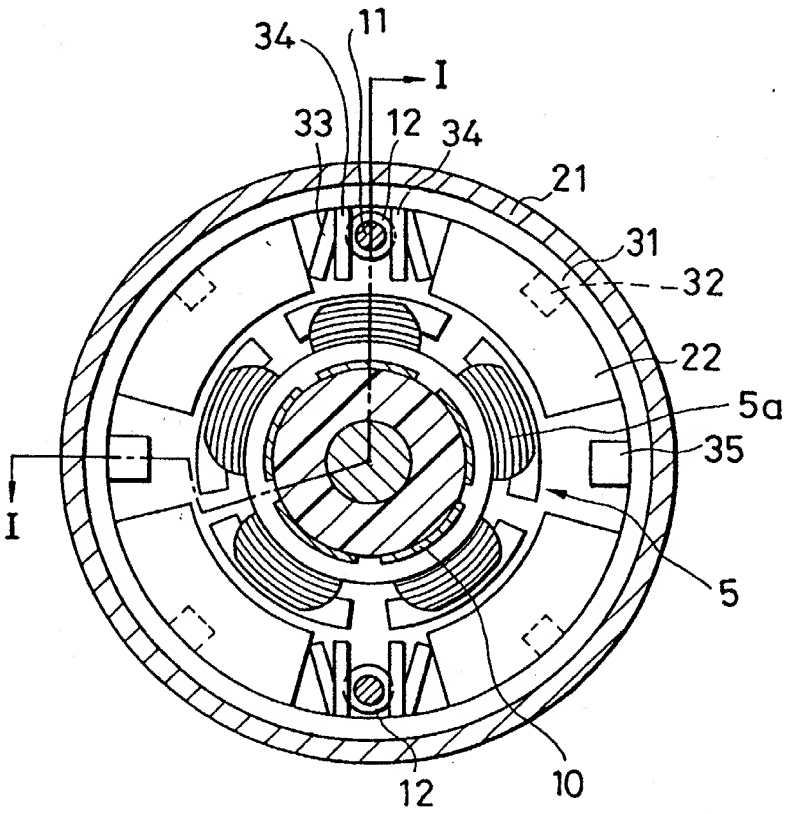


FIG. 3

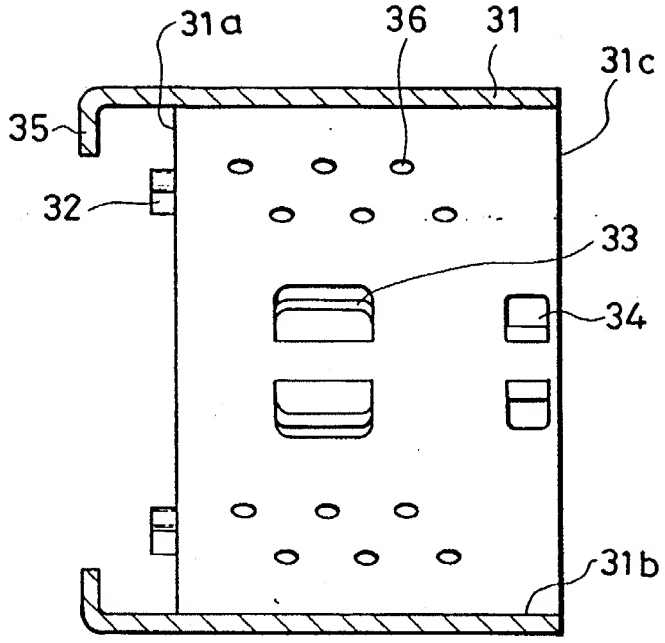


FIG. 4

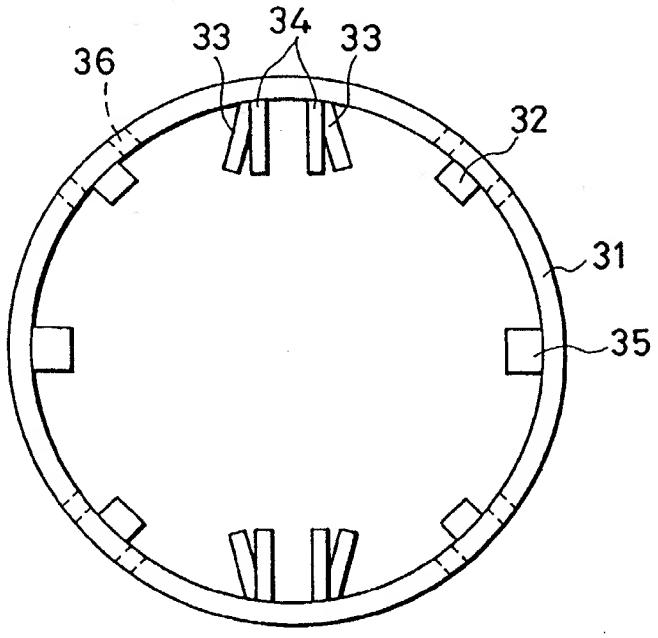
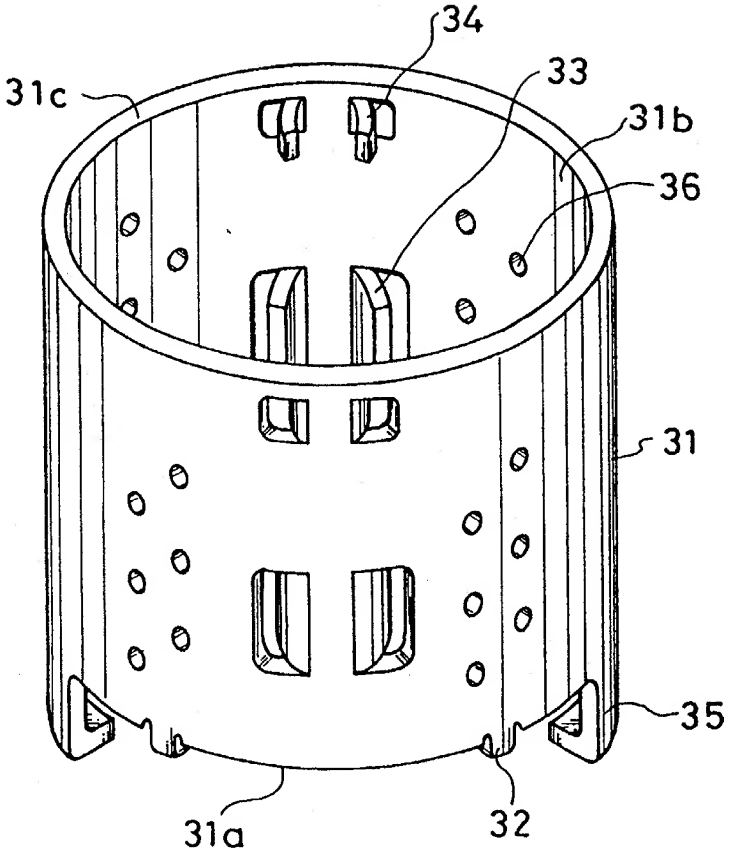


FIG.5



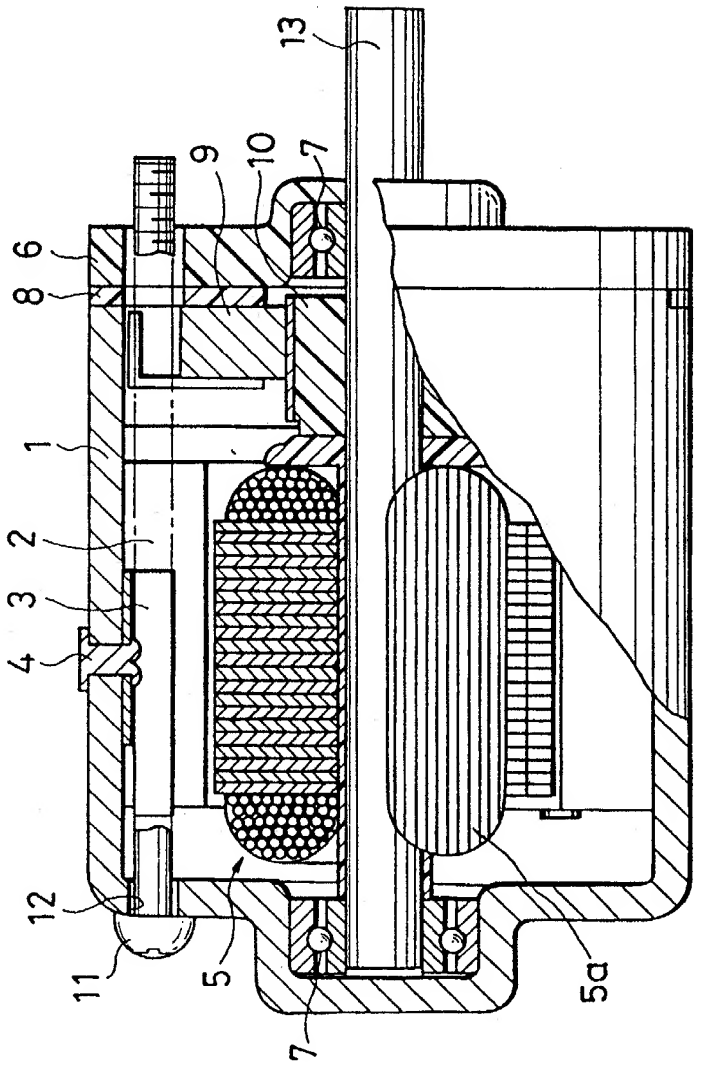


FIG. 6 (Prior Art)